In addition to storage size, accessibility and availability, the manager can employ other criteria for selecting a storage device for assignment to a host requesting file system extension. For example, the SAN manager can eliminate from the selection process any storage device (LUN) whose assignment to the host in question (or any host) in response to a previous file extension request, had failed -- e.g., as a result of hardware failure, software failure or otherwise. The removal of such storage devices from selection menu can advantageously ensure a more efficient file system extension by minimizing the probability that the assignment of a selected storage device that may fail a second (or subsequent) time.

In some embodiments of the invention, one or more storage devices coupled to the SAN utilize RAID (Redundant Array of Independent Disks) storage systems in which part of the physical storage capacity is employed to store redundant data or corresponding control information (e.g., error checking codes). As known in the art, RAID systems are typically characterized under designations such as RAID 0, RAID 1, RAID 2, RAID 5, and so forth.

Typically, the disks are divided into equally sized address areas, typically referred to as "blocks." A set of blocks from each disk that have the same unit address ranges are referred to as "stripes". RAID 0 architecture relates to a disk system that is configured without any redundancy. RAID 1 architecture utilizes mirror redundancy, and RAID 5 architectures employs parity-type redundant storage. For example, in a RAID 5 system, data and parity information are distributed across all of the system disks. In a RAID 5 system, each stripe includes N blocks of data and one parity

block. A RAID '0+1' system, as used herein, employs multiple mirror redundancies for each stripe, and a RAID '1+0', as used herein, employs multiple stripes for each mirror redundancy.

When extending a software RAID file system of a host, it is typically necessary to assign multiple storage devices (LUNs) of the same size to allow for redundant data storage. The SAN manager utilizes a methodology described below to determine the number of storage devices (LUNs) of the same size that are needed for assignment to a host, having access to a RAID file system, that is requesting file system extension.

In particular, the SAN manager utilizes the following algorithm to determine the number of storage devices (LUNs) to be assigned for different RAID file systems:

For a Raid = '1' file system having a number of mirror redundancies (m), the manager determines the number of LUNs (n) in accord with the relation:

$$n = m + 1$$

For a Raid = '0' file system having a number of stripes (s) greater than 1, the manager determines the number of LUNs (n) in accord with the relation:

$$n = s$$

For a Raid = '5' file system having a number of stripes (s) greater than two, the manager determines the number of LUNs (n) by in accord with the relation:

$$n = s$$

For a Raid = '0+1' file system having a number of stripes (s) and a number of mirror redundancies (m), the manager determines the number of LUNs (n) by in accord with the relation:

$$n = s*(m+1)$$

For a Raid = '1+0' file system having a number of mirror redundancies (m) and number of stripes (s), the manager determines the number of LUNs (n) by in accord with the relation:

$$n = (m+1)*s$$

Large Scale Mechanism for Rendering a SAN Topology

As discussed above, the SAN manager (FIGURE 15, item 20) provides a graphical user interface (GUI) to display components of the SAN topology, such as, the hosts, the storage devices, along with their interconnections and attributes. Particularly, as an example of a GUI utilized by the SAN manager 20 of the invention, FIGURE 16 illustrates a display 100 in a portion of which a storage device, and its selected attributes (e.g., serial number, product Id) are shown. The storage device is identified in a first panel, while its selected attributes are displayed in a second panel that is vertically separated from the first. Selection of the storage device in the first panel (by clicking on the icon representing the storage device) results in the display of its properties in the second panel.